

Study Guide

For use with pages 130–136

GOAL Solve equations with variables on both sides.**EXAMPLE 1** Solving an Equation with the Variable on Both Sides

$$5n + 2 = 20n - 43 \quad \text{Original equation}$$

$$5n + 2 - 5n = 20n - 43 - 5n \quad \text{Subtract } 5n \text{ from each side.}$$

$$2 = 15n - 43 \quad \text{Simplify.}$$

$$2 + 43 = 15n - 43 + 43 \quad \text{Add 43 to each side.}$$

$$45 = 15n \quad \text{Simplify.}$$

$$\frac{45}{15} = \frac{15n}{15} \quad \text{Divide each side by 15.}$$

$$3 = n \quad \text{Simplify.}$$

Answer: The solution is 3.**EXAMPLE 2** Writing and Solving an Equation

At a carnival, you spend \$6 on food and buy 12 game and ride tickets. Your friend spends nothing on food and buys 20 game and ride tickets. You both spend the same amount of money. All of the game and ride tickets cost the same amount. How much does each ticket cost?

SolutionLet c represent the cost of each ticket.

Cost of your food	+	Number of your game and ride tickets	•	Cost of each game and ride ticket	=	Number of friend's game and ride tickets	•	Cost of each game and ride ticket
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$$6 + 12c = 20c \quad \text{Substitute.}$$

$$6 = 8c \quad \text{Subtract } 12c \text{ from each side and simplify.}$$

$$0.75 = c \quad \text{Divide each side by 8 and simplify.}$$

Answer: Each game and ride ticket costs \$.75.**Exercises for Examples 1 and 2****Solve the equation. Check your solution.**

1. $24z - 35 = 55 - 21z$ 2. $9z + 12 = 6z - 30$ 3. $5x - 19 = 20 - 8x$

4. A long-distance phone company charges \$.05 a minute, plus a monthly charge of \$5. Another long-distance phone company charges \$.09 per minute, with no monthly charge. For how many minutes per month would you have to use long distance for the phone bills from each company to be equal?

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EXAMPLE 3 An Equation with No SolutionSolve $3(2 - x) = 5 - 3x$.

$$3(2 - x) = 5 - 3x$$

Write original equation.

$$6 - 3x = 5 - 3x$$

Distributive property

Notice that this statement is not true. The equation has no solution. As a check, you can continue solving the equation.

$$6 - 3x + 3x = 5 - 3x + 3x$$

Add $3x$ to each side.

$$6 = 5 \quad \times$$

Simplify.

The statement $6 = 5$ is not true, so the equation has no solution.

EXAMPLE 4 Solving an Equation with All Numbers as Solutions

$$4 - 3(2t + 12) = -2 - 2(15 + 3t)$$
 Original equation

$$4 - 6t - 36 = -2 - 30 - 6t$$
 Distributive property

$$-6t - 32 = -6t - 32$$
 Simplify.

Notice that for all values of t , the statement $-6t - 32 = -6t - 32$ is true. The equation has every number as a solution.

EXAMPLE 5 Solving an Equation to Find a Perimeter

Find the perimeter of the equilateral triangle.

- (1) An equilateral triangle has three sides of equal length.

Write an equation and solve for x .

$$10x + 3 = 13x - 12$$

Write equation.

$$3 = 3x - 12$$

Subtract $10x$ from each side and simplify.

$$15 = 3x$$

Add 12 to each side and simplify.

$$5 = x$$

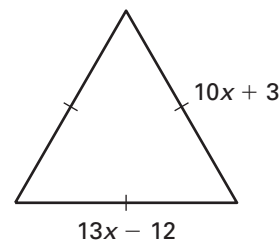
Divide each side by 3 and simplify.

- (2) Find the length of one side by substituting 5 for x in either expression.

$$10x + 3 = 10(5) + 3 = 53$$

- (3) To find the perimeter, multiply the length of one side by 3: $53 \cdot 3 = 159$.

Answer: The perimeter of the equilateral triangle is 159 units.

**Exercises for Examples 3–5**

Solve the equation. Check your solution.

5. $3(14x + 3) = 6(7x + 1) + 3$

6. $3(5 - 6z) = -14z - 2(1 + 2z) + 2$

7. Find the perimeter of a square with sides of length $9x + 11$ and $13x - 1$.